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Rivals for Volta

MUCH water has evaporated from the Gold Coast's rivers since the possibilities of harnessing the Volta as a source of hydro-electric power were first recognized. Yet the Volta River project still awaits final ratification by the governments and companies concerned. Meanwhile, progress is being made towards the finalizing of similar schemes elsewhere in Africa, which, by drawing heavily upon the financial resources of aluminium producers, might conceivably add to the difficulties of finding the required capital for Volta, which is estimated to require £215,000,000 for the initial 80,000 tons stage and £309,000,000 for the 210,000 tons stage (these figures allowing a "safety margin" of 45 per cent for possible inflationary factors.)

Towards the end of last year an international syndicate named "Aluminga" was set up to study the possibilities of building an electrolytic aluminium plant in the Belgian Congo, near the mouth of the Congo, at Inga. Here the river turns through an acute angle and falls over 100 metres in a distance of less than 30 kilometres. Working at capacity, such a project would realize 175,000,000 kW. hours. It is proposed to implement the project in smaller sections, starting off with a production of 5,000,000 kW. Although there are no known deposits of bauxite in the Congo, this presents no difficulties as bauxite is found in many other parts of Africa.

Early this year the first ingot of aluminium ever produced in Africa was turned out at Edea, in the French Cameroons. Edea is to produce 10,000 tons of aluminium this year and 45,000 tons when it reaches peak production in 1959. It is part of a vast plan for using African bauxite and hydro-electric power to raise France's aluminium output, which was 149,774 tons in 1956.

An international company to exploit the bauxite deposit of Fria in French Guinea has now been formed in Conakry. Initial capital of 1,000,000,000 African francs is being supplied by the French firms Péchiney and Ugine, the American firm Olin-Mathieson Chemical Corporation, the British firm British Aluminium Limited, and the Swiss firm Aluminium Industrie AG. The new company, "Cie Internationale pour la Production de l'Alumine," will erect an alumina plant to produce 480,000 tons a year. Part of this alumina will go to the foreign companies, part to the Cameroons aluminium plant, and the bulk to the aluminium industries to be set up in Guinea itself and in the Middle Congo.

The creation of these aluminium industries is under study by the Société Européenne pour l'Etude de l'Industrie de l'Aluminium en Afrique, better known under its abbreviation "Afral". Led by the French association Péchiney-Ugine, it includes Italy's Montecatini, Germany's Vereinigte Aluminiumwerke, the Swiss SA pour l'Industrie de l'Aluminium and the Canadian group, Aluminium Ltd. and its French subsidiary Bauxites du Midi. The last two are exploiting the Guinea bauxite deposits on Loos Island and plan to erect an aluminium plant in the Boke area of Guinea.

Progress in the venture will depend on progress in the construction of the power dams on the Konkouré River in Guinea

and the Kouilou River in French Equatorial Africa.

A further step forward is expected soon when the tenders for the first dam on the Konkouré—to be submitted before February 15—have been examined. Tenders for this dam, at Souapiti, will supply an accurate picture of the costs involved. The results may be vital for the development plans, since the other projects (the Inga plan in the Belgian Congo and the Volta plan in the Gold Coast) may prove serious competitors.

The Souapiti dam will provide 3,000,000,000 kWh. making possible an annual aluminium output of 100,000 to 150,000 tons. The second Konkouré dam, for which technical studies still continue, is to supply another 2,000,000,000 kWh.

The Kouilou dam project—designed to produce 7,000,000,000 kWh. per annum—is now also in a decisive stage. Tenders for the first high-power alternator group will be invited at the end of this month. It is understood that French, British and American groups will be asked to make their offers. The decision whether to go ahead with the erecting of the Kouilou power station is expected to be taken by the French government in the second quarter of the year.

Having regard to the immense developments now pending in Africa, it is to be hoped that, when Ghana takes over the reins of self-government, no time will be lost in bringing to finality the Volta project, which is potentially such a key factor in the future prosperity of a country whose economic prospects are critically dependent on the continued development of its rich mineral resources.

MORE URANIUM "GUESSTIMATES"

Last week we cited figures given by Dr. Willard F. Libby, Commissioner of the Atomic Energy Commission, who estimated that within a decade or two U.S. requirements of uranium oxide would probably amount to some 25,000 tons of this material per year, with world requirements ranging from 40,000 to 100,000 tons. He believed that the cumulative uranium oxide total by 1975 could reach 75,000 to 100,000 tons, by which time the annual requirement might be between 20,000 and 30,000 tons. This figure could be compared with the 1956 production of uranium oxide, which was 6,000 tons and with the 1958 production goal of at least 15,000 tons. (*The Mining Journal*, 15/2/57, p. 207.)

Further light on the outlook for the uranium industry has since been thrown by Sir John Cockcroft, Director of the U.K. Atomic Energy Research Establishment, who stated that by the 1960's the Western world would be producing uranium in quantities of well over 30,000 tons a year, which was equivalent in terms of present-day reactor furnace power production to about 300,000,000 tons of coal a year. By the late 1960's, the efficiency of the "burn up" of uranium would probably have increased by about three times and an annual uranium production of 30,000 tons would then be equivalent to about 1,000,000,000 tons of coal. By 1957 supplying Britain's electricity stations would require the burn up of between 3,000 and 4,000 tons of uranium a year, with an initial investment for new power stations rising to something like 2,000 tons a year.

Britain also envisaged in the future the industrial use of heat produced by nuclear reactor furnaces. Among industries which could use heat power from nuclear reactors, Sir John instanced the steel making and chemical industries, each of which uses between 6,000,000 and 7,000,000 tons of coal a year.

Also among the prophets is Barclays Bank DCO in its *Overseas Review*, which recalls that the world's military

requirements of uranium metal have been placed at between 10,000 and 15,000 tons a year, and refers to a suggestion that the demand for peacetime uses will absorb more than 10,000 tons a year.

It is noteworthy, however, that whereas Dr. Libby quoted from an A.E.C. report to the effect that a hydrogen reactor was "purely of academic interest for the foreseeable future", Dr. T. E. Allibone recently told the Institution of Electrical Engineers in London that by 1965 the U.K. might be able to use the reaction of the hydrogen bomb, the conversion of hydrogen to helium, in a controlled manner. Nevertheless, it will be many years, if ever, before thermonuclear power constitutes a serious threat to the uranium industry.

Meanwhile the production of uranium continues to expand with truly atomic speed. A notable event in Canadian mining history was the official opening of the Quirke Lake and Algorn-Nordic mills in the Blind River area. Plant construction started in April and July, 1955, at Quirke and Nordic respectively, production in October, 1956, and January, 1957—in each case 18 months after the start of construction and less than 3½ years after the commencement of drilling. This remarkable achievement on the part of Algorn Uranium Mines Ltd., which are managed by the Rio Tinto Mining Company of Canada Ltd., is a welcome indication of Britain's growing participation in the expansion of Canadian mining.

Eldorado Mining and Refining Co., Canada's Crown-owned undertaking, plans to spend \$1,720,500 this year for a start on its new project to produce uranium metal at Port Hope. At present Canada does not produce its own uranium metal. Instead, it sells uranium oxide to the U.S. and purchases the processed metal from that country. Eldorado has also received government approval to spend \$2,883,700 this year on expanding the capacity of its uranium ore mill at Beaverlodge, on Lake Athabaska in north-west Saskatchewan, to 2,000 tons daily from 500 tons.

In Australia, too, rapid progress is being made in the expansion of uranium production. Sir Thomas Playford, the Prime Minister, stated last week that uranium deposits at Crookers Well, north of Radium Hill, might soon become South Australia's major uranium venture. A decision on a proposition submitted to overseas interests concerning developments at Crookers Well should be made within a few weeks.

The uranium reserves of Metropolitan France have been officially re-estimated at between 50,000 and 100,000 tons, of which 10,000 tons have been proved by direct working. These figures do not include the considerable uranium reserves believed to be available in the superphosphate ores of North Africa.

METALS IN THE EMERALD ISLE

Recent reports from Eire indicate a further broadening of prospecting and exploration in that land of long dormant mines.

Diamond drilling operations at the old copper mines near Bonmahon, County Waterford, in Eire, are reported to have revealed a gold stratum about 30ft. wide and "several hundred feet long". Samples sent to Canada for analysis assayed 1.3 oz. to the ton. Efforts are to be made to speed up the mineral survey at Bonmahon, which is being undertaken by Bonmahon Copper Mines Ltd., a subsidiary of Explorers Alliance Ltd., of Toronto.

Another Canadian firm, the Priority Mining and Drilling Co. Ltd., has begun trial borings in old copper and lead mines near Oughterard, County Galway. Borings are

being made at Glengalway and at the Hill of Doon, on the shores of Lough Corrib, and at another point known as the "Lead Mines". This exploratory work was to be extended before the end of February with the arrival of heavy drilling machinery from Canada.

Explorers Alliance Co., of Toronto, are to undertake prospecting work immediately in disused copper mines in the Mizen Head Peninsula, West County Cork. It is intended to begin a survey of 12 old copper mines between Ballydehob and Crookhaven.

U.S. COAL PRICE BOOST

Soft coal price increases of 25 c. per ton are being proposed by operators in current negotiations between coal owners and the principal utility companies. The rises are said to be necessary in order to off-set increasing wage and material bills. The higher coal prices are expected to come into effect on April 1; the same day that more than 200,000 soft coal miners are to receive an 80 c. a day wage increase under the two-stage advance negotiated by the miners' union and the operators' union last October. At that time wages went up by \$1.20 per shift and coal prices were correspondingly increased by 25 c.-40 c. per ton.

Present contract prices of steam coal in Northern West Virginia, which ships much of its tonnage to East Coast utilities, is \$4.80 at the pit head.

As producers move ahead with plans to boost prices, soft coal production is falling off slightly although the decline in demand is said to be transient. Nevertheless, during the first few weeks of this year, production of soft coal is down 10 per cent on the figure for the corresponding period of last year. Although most of the big producers continue to enjoy sustained markets a few of the smaller mines have had to cut production and some are operating a three-day week.

In order to maintain sales some of the smaller marginal mines are reported to be selling coal for as much as 50 c. per ton below normal prices. The bituminous coal industry in America, consisting as it does of many thousands of units, has long been a fertile field for price undercutting. Many small operators move in and out of the market as demand dictates and by employing non-union labour find it relatively easy to adjust the selling price of their produce.

Most coal men, however, are confident that 1957 will be a good year in view of the bolstering of the market by overseas demand which is expected to rise to 60,000,000 tons in the current year.

Paley in Retrospect

The British Metal Corporation's annual *Review of Non-Ferrous Metals*, which has recently appeared for 1956, is, as usual, an interesting and authoritative report. Confining itself to copper, tin, lead and zinc, the *Review* stresses the underlying strength of the demand for these metals, even during 1956. Thus, while noting that the rate of demand during the year "grew temporarily less robust and, from having outpaced consumption over a long period, fell far behind in the second quarter of 1956", the *Review* notes that consumption, which as distinct from demand is a more basic long-term factor, repeated the high levels of 1955. This really is to say that in recent months buyers have been holding off the market in anticipation of easing prices rather than actually using less. However, the fact that stocks are generally easier now than a year ago, owes less to this factor than to the fact that for the moment the rate of growth of production is overhauling growth of consumption.

This has been particularly true in the case of copper. Even a year ago many authorities were forecasting a short-term position of over-supply of copper, although producers continued to press ahead with extensive long-term expansion programmes in the expectation that in the long run all this output and more, would be needed.

The manner in which consumption in the Free World has shot ahead since 1950 is brought out very clearly in the statistical table, which we reproduce from the B.M.C.'s *Review*. The figures refer only to the consumption of newly-mined metal.

The point about this tabulation is that it underlines the fact that during the first six years of the twenty-five-year period, over which Paley forecasts were projected for these metals, U.S. consumption has fallen considerably short of expectations, whereas consumption in the rest of the Free World is at a vastly higher rate than Paley had ever foreseen. It was, of course, this kind of miscalculation which led the American copper producers into excessive restrictions

of output in the early months of 1954 and which led to the spiralling of the copper price from which we are only now recovering. The B.M.C. does not say so, but it would seem to us a reasonable assumption that the relatively slow rate of growth in American consumption of these older metals, in the face of what has been a period of rapid industrial expansion in that country, must be accounted for to a considerable extent by the erosion of these markets by substitutes such as aluminium and plastics. As usual, technological advances of this kind tend to manifest themselves more quickly in the New World, although we must expect to see similar trends developing on this side of the Atlantic in years to come.

The case of tin is, of course, slightly different as here the main factor at work has probably been conservation rather than substitution, and here again this technology has gone much further in the States than elsewhere.

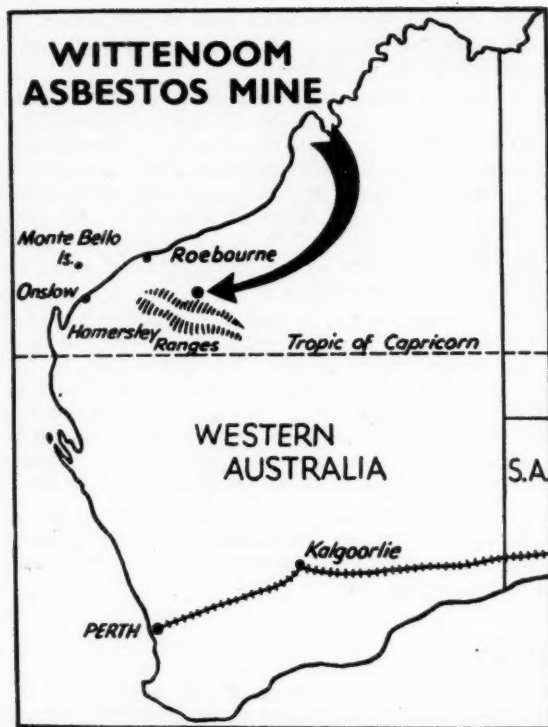
There are limits to the economies of substitution and conservation and in the States they have undoubtedly been pushed fairly energetically in recent years within a period when the older metals were especially highly priced, and it may well be that we shall see America's rate of consumption growth in these metals picking up again in the years to come.

GROWTH OF CONSUMPTION OF OLDER BASE METALS ('000s Ltons)

		Pre-War to 1950*	1950 to 1956	1950 to 1975†
Copper :	United States ...	+600	+90	+485
	Rest of Free World ...	+10	+490	+630
	Soviet Sphere ...	+80	+130	
Lead :	United States ...	+350	-80	+370
	Rest of Free World ...	-250	+180	+585
	Soviet Sphere ...	+40	+140	
Zinc :	United States ...	+480	+40	+375
	Rest of Free World ...	-20	+320	+570
	Soviet Sphere ...	+100	+170	
Tin :	United States ...	+8	-10	+13
	Rest of Free World ...	-3	+12	+36
	Soviet Sphere ...	+2	+8	

* "Pre-war" is here the average of the four years 1935-1938.

† Projected in the Paley Report.



THE blue asbestos (crocidolite) occurrence in the Hamersley Ranges has been known for many years and was first brought to the notice of the Mines Department in Perth in 1917, but, as no demand for the fibre existed at the time nothing was done about it. Some demand for long blue fibre in 1937/38 created a mild boom in the area when about two hundred prospectors were engaged in the production of hand-cobbed long fibre. The boom was shortlived, however, and the market quickly disappeared.

Some milled fibre was produced by West Australian Blue Asbestos Fibres Ltd., and by Mr. L. G. Hancock in Yampire and Wittenoom Gorges respectively between 1938 and 1943. The former company closed down after approximately three years' operation and the Hancock interests were taken over in 1943 by the present operating company, Australian Blue Asbestos Ltd.

The two seams, each consisting of only 2 in. to 3 in. of fibre, occur high up in the side of a cliff and a road is necessary up and along the cliff to gain access to the seams. The current system of mining, evolved after several years of trial and error, is effective and highly efficient.

The main development is planned to enable both seams to be exploited. As the dip of the seam is in the order of 8 deg., a main adit, 15 ft. wide, has been driven on the dip and 40 ft. under the lower seam. Twenty feet above the main adit 8 ft. by 7 ft. crosscuts are driven on strike. Access is gained to the crosscut from the main adit by means of an incline to the manways and ore chutes are cut between the crosscuts and the ore bodies. Stopes are opened up approximately 400 ft. by 300 ft.

The fibre occurs in a formation approximately 18 in. thick and consequently any barren rock broken in excess of 18 in. adds to the dilution of the ore. Geological

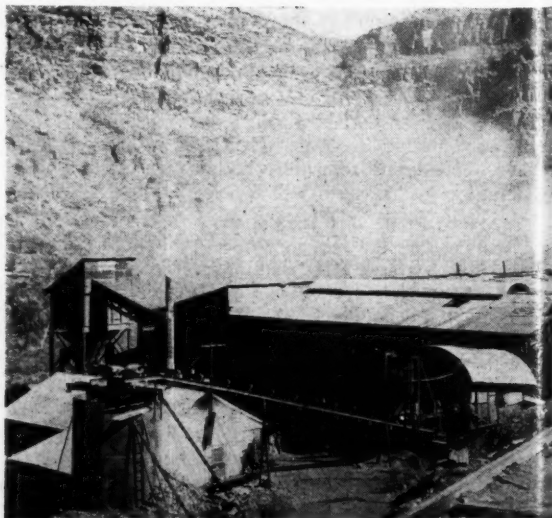
Mining Blue Asbestos in W. Australia

Mining and preparation of blue asbestos fibre is carried out by Australian Blue Asbestos Ltd. at Wittenoom Gorge in the Hamersley Ranges of Western Australia. The Hamersley Ranges are situated in the north-west of the State, the western end being about 75 miles south-west of Roebourne and the eastern end approximately 175 miles south of Port Hedland. The Hamersleys are 175 air miles north of Perth. The following article is condensed from a paper published in *Chemical Engineering and Mining Review*.

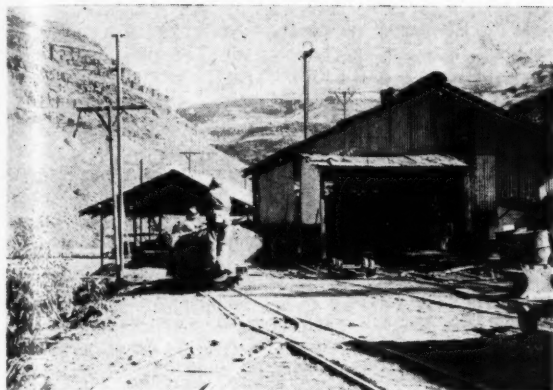
peculiarities in the formation determine the minimum height broken and this almost invariably is 43 in. Because of the stratified nature of the formation, the cleavage, both on the floor and back, is clean and smooth. Pillars amounting to 8 per cent of the total area are left at about 24 ft. centres and all other broken rock is taken to the treatment plant as ore. No support, other than the pillars, is necessary.

Handling of the ore to chutes is done by scraper haulers and the ore then passes from the chutes to a train of Granby cars which dump it into an ore pocket situated immediately over the main adit. Ross feeders control flow of ore from the pockets on to a 30 in. belt conveyor, which puts the ore into a bin in preparation for transport to the treatment plant.

The rock mined is hard and abrasive and drilling costs are high. The hardness has its compensation, however, in as much as no artificial support is needed and a high recovery of ore is obtained. Light, high-speed drills, using $\frac{7}{8}$ in. hexagonal tungsten-tipped steel and airlegs, are standard equipment.



The crushing plant at Wittenoom Gorge



An electric railway track penetrates the main drive into the deposit

important and this can be achieved only by trommelling until the required standard of cleanliness is reached.

The fibre is packed in jute bags, each containing 100 lb., and in this condition it is sold principally to manufacturers of asbestos cement products.

Wittenoom is 200 miles from the port and it is necessary to transport the asbestos by motor truck for that distance. The ore is shipped 1,000 miles to Fremantle for distribution, mainly to overseas users. At present about half the total production goes to America and the remainder is absorbed by practically all European countries.

Because of the bulky nature of the asbestos, and the great distance between the mine and port of distribution, transport cost is a major problem for the industry to face and one which can be reduced only by sympathetic governmental consideration regarding road construction, reduction of duties on fuel, and provision of good port facilities.

The general recognition of the high quality of crocidolite fibre and a rapid increase in its use for asbestos pressure piping, particularly throughout Europe and America, has made it possible to expand the export market for Australian fibre to the present 8,000 tons per annum, valued at £800,000. It is believed that the overseas market for the asbestos fibre will continue to expand.

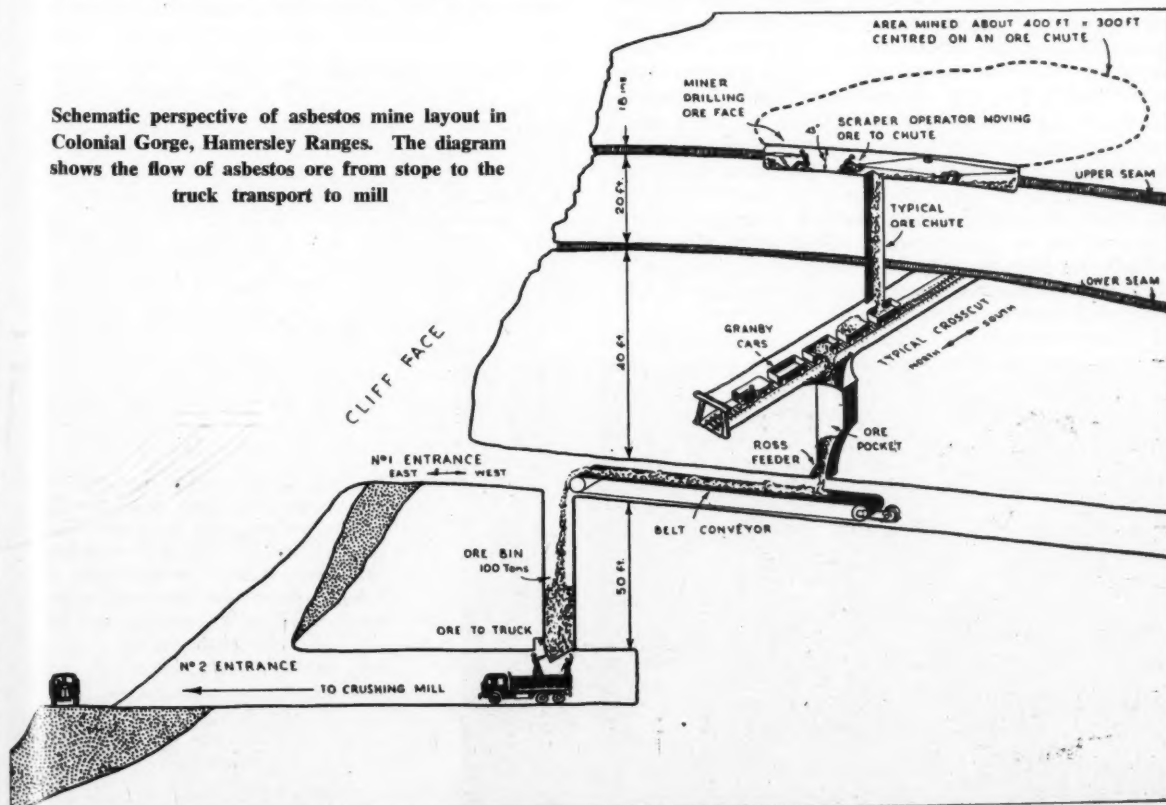
Already the value of production from Wittenoom is a real feature in the economy of Western Australia and with the anticipated increased production after two or three years, the venture should be a major asset to the State and to the Commonwealth for many years to come.

Ventilation is achieved by first blocking out the stopes and establishing air circuits before the main body of ore in the stope is extracted. The "stope preparation" is carried out at the same height at which the stopes are mined, but on a 24 ft. width, and air is forced into these drives by fans in the same way as is done in developing any mine. A schematic perspective diagram shows the general mine layout and mine operation.

Because of the rather heavy dilution, some barren rock is removed by hand picking before the ore goes to the crushers. Reduction of ore to about $\frac{1}{2}$ in. mesh is done by conventional crushers, viz., Jaw, Cone and Symons crushers. Further reduction is done in rolls and the extraction of fibre is achieved by passing the material through impact or hammer mills and then over shaking screens from which the fibre is aspirated and collected in cyclone separators.

Removal of grit and dust from the finished product is

Schematic perspective of asbestos mine layout in Colonial Gorge, Hamersley Ranges. The diagram shows the flow of asbestos ore from stope to the truck transport to mill



Ore Beneficiation in the United States

THE fruits of applied research in ore beneficiation have been amply demonstrated in recent years. Taconite has become a source of iron; titanium is being derived from ilmenite; and uranium ores assaying less than 1 per cent uranium are being successfully processed. Other materials being taken from ores are molybdenum, vanadium and selenium from copper ore, and vanadium from uranium ore. Some ores are being worked for several minerals.

Chemical, metallurgical and ceramic process engineers of the Stanford Research Institute in California, with the assistance of inorganic and surface chemists and economists, have been taking an active lead in beneficiation of metallic and non-metallic ores. A strong motivation is the Institute's interest in greater utilization of Western United States mineral resources and in the application of such advanced techniques as organo-metallic reactions, solvent extraction, and ion exchange. Owing to the high cost of re-agents, American industry has used ion exchange only in the upgrading of valuable materials such as low-quality uranium ores. However, researchers at the Institute are exploring application of the process to other minerals.

The Cost Obstacle

Selection or development of a beneficiation process is based on a thorough mineralogical, chemical, and physical property evaluation. Institute economists study marketability and distribution of mineral products, and costs of raw materials. The lower the grade of ore, normally the higher the cost of concentration. However, increased market values of various mineral products and new low-cost processing methods are overcoming the cost obstacle.

A significant example of the Stanford Research Institute's co-ordinated effort is the recent successful project conducted on the beneficiation of a phosphate sand deposit on the west coast of Baja, California. A potentially limitless source of phosphate for Western U.S. and Orient fertilizer makers was discovered in 30-odd miles of lagoons and offshore bars of sand. The phosphate is found—and replenished by natural phenomena—in the lagoons and islands as a very low-grade (4 per cent P_2O_5) ore.



The mineral processing laboratory of the Stanford Research Institute. In foreground sink-float for heavy density separation partially conceals Humphrey spiral. Wilfley table is being operated and continuous flotation circuit is to rear backed by grinder

The mining industry in the United States is presently being faced with an incontrovertible fact, namely that accessible deposits of various high-grade materials are dwindling rapidly. This development is of special consequence to the eleven Western states, historically the leading producers of such essential minerals as copper, mercury, boron, tungsten, potash, phosphate, silver and gold. The research budgets of mining companies, therefore, are being augmented to develop profitable means of up-grading abundant lower-quality deposits and residues of earlier mining operations.

Despite its low quality, the ore became of interest for several reasons: the apparently boundless quantity and accessible location; presence of valuable by-products (quartz, zircon, ilmenite); and its existence as a surface deposit of unconsolidated, uniformly-sized sand already washed free of slime impurities. The latter conditions enable the by-passing of the normal pre-processing steps—mining, crushing, and screening—to upgrading.

The surface of the phosphate particles and particle-size distribution make it ideal for anionic flotation. In the first step of this recovery process, a fatty acid film is adsorbed and reacts with the red phosphate particles making them water-repellent but adherent to air. (Selection of proper flotation agents forms a key part of the research job.) The coated phosphate particles are propelled upward with air bubbles in a vessel to form a froth at the surface which can be skimmed off. This product contains 20 per cent P_2O_5 .

Enriching the Phosphate

The phosphate, however, must be upgraded to the 25-30 per cent range required for commercial uses. By subsequent separation of accessory materials (ferromagnesian, ilmenite, zircon) by cationic flotation or electrostatically, the phosphate is boosted into the desired range. By magnetic separation, impurities containing iron can be extracted for a richer phosphate. By additional treatment, the valuable by-products can be obtained in saleable form.

At this stage of the project a "floating pilot plant" is

under consideration as well as a complete market study.

The new research approach to ore beneficiation has led into other avenues. The potential commercial value of a "waste" clay at Corona, California, was considerably enhanced through a settling process, whereby the clay fraction is separated from sand, grit, and impurities in the slurry which collects in a Corona glass company's water-recovery system. The clay was found to have the proper viscosity and gelling properties for use in oil-well drilling muds, and sufficient adsorption to serve as a potential bleaching agent for various mineral and vegetable oils.

In a search for a suitable clay deposit for the Northwest States paper-coating industry, staff researchers decided on an Ione, California, source which previously had been of no commercial value. A chemical and physical analysis, however, turned up evidence that the Ione deposit also contains a sand of value to the glass and refractory in-

dustries. The beneficiated sand is of the high-grade quality in demand by glass makers (iron oxide and alumina impurities less than 0.04 per cent and 4 per cent, respectively). The Ione 60 per cent sand-40 per cent clay deposit subsequently has become the site of large-scale glass and and refractory clay plants. These plants' products are being used as raw materials by glass and refractory producers in the San Francisco area.

In another project, scientists ascertained the inapplicability of an existing process for the recovery of vanadium from a lean ore. Subsequently, a new economical and technically feasible process was developed. A simultaneous comparative investigation of vanadium recovery by ion exchange and precipitation was conducted. The precipitation technique was incorporated into the new process.

New uses were found through a beneficiation process for a Hectorite clay from California's Mojave Desert.

Hydraulic Coal Mining in Russia

It is not only in Siberia that the hydraulic method is being used by Russian mining engineers. Many shafts of the Karaganda coalfield in Soviet Central Asia are turning over to water both for coal-cutting and transport. At Saran, in Pit No. 106, the passage of a 225 yds. drift has been completed, where the coal will be taken to the surface by a powerful stream of water. Chambers for pumps, crushers and other equipment have been constructed in the drift.

The plan of the Dubovskaya-2 pit was worked out by the Karaganda Hydro-Mine Trust. Water from special reservoirs will be pumped at a pressure of 45 atmospheres and a speed of 300 ft. per sec. against the coal seam. The coal forced out will run along gutters to a collecting shaft. From there it will be taken to store heaps by powerful coal-pumps. The system is expected to double the coal output.

The Soviet coal industry, faced like the British with a growing labour shortage and a rising demand, is paying a lot of attention to this hydraulic method. It was described in some detail in an article in *Pravda* by Dr. V. Muchnik, Director of the U.S.S.R. Hydro-Coal Research and Project-Construction Institute in the Kuznetsk Basin of Siberia. He points out that the water can penetrate seams impossible to the miner, and can quite easily be caused to distribute the coal over large distances. Dr. Muchnik says:

"The hydraulic method brings the whole process of coal-getting into one operation with a single mechanism—the hydromonitor—working with water at 30 to 80 atmospheres pressure. So, too, with the underground transport, which at present uses conveyors, electric trains, winches, skips—all replaced by the coal-pump alone. The reduction in the number of basic operations with their absorption of labour, and the elimination of many secondary operations, raises the productivity of labour from three to five times."

Planning a Hydraulic Pit Region

Experience in the Kuznetsk Basin is at present limited to one complete hydro-pit and a hydraulic complex in another. In the complete hydro-pit, however, the productivity of labour, including concentration, worked out last year at 96 tons per man-month; the production cost was half that of the coalfield's average and approached that of opencast mining. By the end of 1956 productivity reached about 125 tons per man-month.

Dr. Muchnik urges that a number of pits should be com-

Russia has led Britain both in underground gasification of coal (though the technique was first proposed by a Briton) and in hydraulic mining. Mr. W. T. Shepherd, general manager of No. 1 Area, East Midlands Division of the N.C.B., in an official tour of the Markham Colliery's coal "piping" system this January, remarked that in Siberia recently he saw completely hydraulic pits in which coal was cut by water power and transported to the surface by the same method. Details of these pits, which Mr. Shepherd did not give, are interesting.

lined into a single region with a single economy and a central concentration plant, to which the coal from all the pits would be brought hydraulically.

Already several such regions have been earmarked. One such is the Belovo-Leninsk region in the Kuznetsk Basin, where it is possible to construct hydro-pits with an output of 6,000,000 to 7,000,000 tons of coal a year. The plans for three of the pits have been completed. Plans are now being drafted for the Baidayevsk region, which will have an output of 4,500,000 to 5,000,000 tons. The Karaganda hydro-pits are scheduled to produce up to 5,000,000 tons a year—and deliver it hydraulically 47 miles to the Kazakh Steelworks.

In the first hydro-pit projects the total capital expenditure was 10 to 15 per cent less than in the construction of a conventional pit. The designers eventually produced plans which, in the conditions of the Kuznetsk Basin, gave a productivity of labour four times that of the conventional mine, a production cost of less than half, and a construction cost of half.

Ordinary coal concentration plants with a production of 4,000 tons per 24 hrs., designed for the Kuznetsk Basin, occupy 2,500,000 to 3,500,000 cu. ft. The Institute's earliest designs were able to reduce it to 1,680,000 cu. ft., and later designs to 780,000 cu. ft. "Nor is that the limit", claims Dr. Muchnik, "There is reason to think that after further research and the creation of new machines it can be cut to 450,000 or 480,000 cu. ft."

Working in co-operation with the Institute, the Bobruisk Engineering Works produced a new multi-phase high-pressure coal-pump for raising the coal to great heights. Other new machines produced are sediment centrifuges with an output of 150 tons an hr., which simultaneously clean the water and dry the coal.

Work has begun on the creation of a new mechanical hydraulic coal-cutter calculated to cut 100 to 120 m. per shift—40 times as fast as the best mechanical combine.

Expansion of Moroccan Mining During 1956

MINING was generally the only sector of Moroccan industry to register improvements on the previous year and in some cases establish production records during 1956, according to a statement by the Minister of National Economy, M. Abderrahim Bouabid.

The most spectacular improvement was in iron ore production with an increase of 58 per cent to 489,690 tons in 1956. The figure does not include output from the former Spanish zone and represents mainly production at the Ait Amar mines at 420,000 tons of ore (metal content 45 per cent). Added to Mellila production, and with the exploitation of the large deposits of Tindouf, Morocco would become one of the world's major producers of iron ore, the Minister said. Tindouf is theoretically in Algeria but Moroccan nationalists claim this and other parts of the Sahara as integral parts of Morocco. The increase in production at the Ait Amar mines was made possible by a big improvement in world market conditions coupled with security and stability within Morocco itself.

Impact of Suez

The Ait Amar mines are operated by the Société Marocaine de Mines et Produits Chimiques. The mines closed down for two weeks at the beginning of February due to the fact that no shipping space was available to export the ore to Great Britain. Officials said lack of shipping was caused by the Suez situation. The 1,200 workers at the mine were given one week's holiday with pay and, unless the shipping situation improves radically in the meantime, they were to work only 40 hours a week instead of 48 when mining operations resume. The United Kingdom took 408,521 of the 467,006 tons of iron ore exported.

Phosphates continued to progress steadily during the

year, and total production at Khouribga and Louis Gentil reached the record of 5,521,817 tons, of which 4,257,266 tons came from Khouribga. A total of 4,280,000 tons was exported through Casablanca alone. Production in 1956 was approximately 4 per cent better than in 1955.

Indeed, a new phosphate export record was attained in 1956 with a total of 5,518,453 tons of which 756,647 tons went to Italy, 753,037 tons to France, 739,941 tons to Britain, 485,401 tons to Spain and 346,371 tons to South Africa.

Another major improvement was in anthracite with 482,000 tons or 32 per cent more than in 1955 from the Djerada mines. Metallurgical manganese from Tiouine, Imini and Bou Arfa increased by 3.1 per cent to 383,115 tons, whilst chemical grade manganese was slightly down from 39,773 tons in 1955 to 38,294 tons last year.

Exports of metallurgical manganese were up to average with 351,880 tons, of which 246,278 went to France, 69,237 to the U.S.A. and 23,924 to Norway, while France bought 19,635 tons, the U.S.A. 11,290 and Britain 1,248 tons of chemical grade manganese out of the total exports amounting to 34,820 tons.

Decreased Production

The most important falls in production were in zinc and lead ores, the former falling by 9.1 per cent to 70,921 tons and the latter by 1.7 per cent to 120,047 tons. France bought most of the lead ore (88,454 out of 90,565 tons exported) and most of the zinc ore as well (69,380 out of 70,022 tons).

Cobalt ore, too, fell by 15 per cent from 7,573 tons to 6,438 tons; however, the installation in 1956 of a new washery is expected to raise production to between 8,500 and 10,000 tons in 1957 at the Bou Azzer du Grara mines operated by the Société Minière du Bou Azzer, a subsidiary of the Ominium Nord Africain.

Prospecting for Oil

Production of crude oil declined by 5 per cent to 97,452 tons in 1956, but the Moroccan authorities declare that prospecting will be intensified during the coming year. In fact it is reliably reported that the Cortès Oil Company of Denver has reached an agreement with the Compagnie Chérifienne des Pétroles whereby the former will prospect on the latter's behalf in the Rharb, Pre-Rif, Mogador and Sous areas where the C.C.P. holds permits.

Several mineral workings were stopped during the year under review, including the Société le Molybdène's uranium ore workings at Azegour, the Tiouit gold deposit, all mica workings, graphite, antimony ore and beryl. Tin ore was down to a mere eight tons, and asbestos fell from 572 tons to 344. Similarly, silver production from the lead-zinc deposits in north-eastern Morocco was nil compared to 309.7 kg. in 1955.

PRODUCTION AND EXPORT FIGURES FOR 1956

Material	Production (000's tonnes)	Exports
Anthracite	482,000	236,901
Phosphates	5,521,817	5,518,453
Lead ore	120,047	90,565
Zinc ore	70,921	70,022
Petroleum	97,452	—
Metall-manganese	383,115	351,880
Chem-manganese	38,294	34,820
Iron ore	489,690	467,006
Iron oxide	1,173	1,034
Iron pyrites	1,548	—
Cobalt ore	6,438	6,809
Antimony ore	—	42
Copper ore	2,863	2,597
Gold	8.2*	—
Silver	—	5,790*
Asbestos	344	18
Tin ore	8	—
Tungsten ore	3,795*	—
Beryl	—	12.5
Barytes	29,594	25,800
Fluorine	154	409
Gypsum	25,460	9,775
Salt	34,188	—

Note: Figures in tonnes apply to the southern (former French) zone.

* Kilograms

Machinery and Equipment**Fans for Handling Corrosive Fumes**

A complete range of axial flow fans from rigid P.V.C. is announced by Horwath Smith and Co., Ltd. Following axial flow practice, these fans are mounted direct into the duct and are stated to give maximum extraction efficiency. They handle corrosive fumes up to 70 deg. C.

In the construction of these oxythene units of rigid P.V.C., the fan case is of welded Duoply laminate construction, flanged at the ends for incorporation in the duct. The impeller is all rigid P.V.C. construction built around a cast aluminium core. The motor is coated with Vinyl-based enamel and stoved, and is supported by an M.S. ring bolted to the exterior of the P.V.C. fan case. It is supported in position by three steel elongated tubes encased in P.V.C., which not only line the motor and impeller in position but also act as breather ducts for the motor. No live parts are exposed inside the motor. By these arrangements the motor can "breathe" freely and yet not come into contact with the acid fume.

PROTECTION FOR "SLUNG" MATERIALS

The new Talurit safety sling, a further development of the Talurit mechanical wire rope splice, is presented as providing safety for all supported materials in that rubber sleeves, combined with the assembly arrangement and coupled with high flexibility, ensure a tight grip on a load. This grip applies even when the load is of irregular contours. The device has obvious applications in the mining industry.

The slings are designed and manufactured by Cable Covers Ltd. to a factor of safety of 8:1.

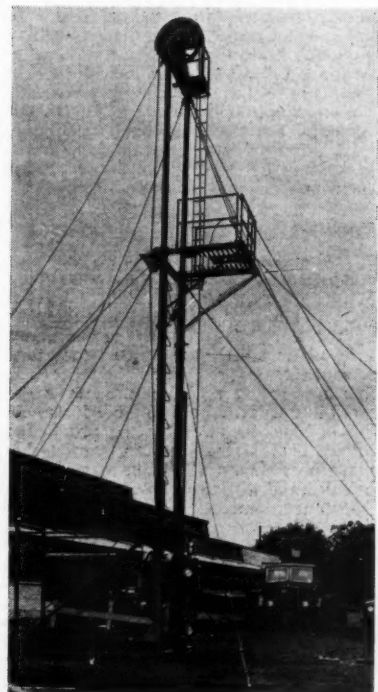
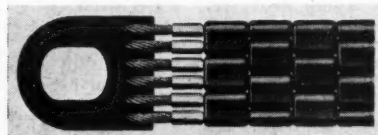
GRINDING WHEEL DRESSERS

With obvious applications in mine workshops, the grinding wheel dressers manufactured by Danite Hard Metals Ltd., are presented as the latest development of the manufacturers. The dressers have completed a six-months' market test.

The Diard Dresser consists of a composition of many particles of diamonds and boron carbide firmly bonded in a hard carbide matrix which is exceedingly tough and abrasive.

The quality of these dressers is not dependent upon the quality of a single diamond, but upon the average quality of many small diamonds. The possibility of loss through defective diamonds is held at a minimum and there is a more uniform performance. More effective use of diamonds results in greater saving. Due to the ability of the special matrix to interlock with even the smallest diamond particle, every diamond is held up to the work until the last particle is consumed throughout the whole impregnated

The top illustration shows the Talurit shackle, while immediately below is the Ratemeter, manufactured by General Radiological Ltd.



This diamond drilling rig, powered by a Perkins diesel engine, is a product of Mindrill Ltd., of Australia, who fit Perkins P4, P6 and R6 diesel engines in drilling rigs and pumping units of Australian manufacture

matrix. The whole head is utilized and needs no remounting.

The matrix is an abrasive in itself, little below the hardness of the natural diamond. There are four types, D.1, D.2, F.1 and F.2. Impregnation is respectively $\frac{1}{4}$ in., for the D types and $\frac{1}{8}$ in. for the F types.

A GEOLOGICAL SURVEY UNIT

The Ratemeter, manufactured by General Radiological Ltd. is a fully sealed tropicalized instrument intended for the detection and measurement of gamma radiation. It is suitable for rapid search work or for accurate measurement and is particularly suitable for geological survey work.

The Ratemeter, which is built into a watertight metal case, is fitted with a desiccator and is able to operate at extremes of temperature, pressure, and humidity. The batteries are of internationally available type and can easily be replaced. The battery container is completely sealed off from the body of the instrument. Indication of the degree of radioactivity is given on a meter or by earphone.

The instrument is designed to permit easy servicing in the field, the whole of the lower part of the case being removable whereby the assembly is completely revealed. The high voltage current for the G.M. tube is supplied from a transistor circuit and is very carefully stabilized so that voltage fluctuations due to battery discharge cause no loss of accuracy. The H.V. circuit has been designed to accommodate a range of Geiger counters between 350 volts and 450 volts.

The main switch of the unit has four positions, namely off, battery test, range one, and range two. In battery test the battery voltage is indicated on the meter to ensure that the equipment is not operated when the batteries are so discharged as to cause inaccuracy. Range one provides a full scale meter deflection on a dose rate of 0.5 m.r. per hour, while range two provides full scale deflection for a dose of 5 m.r. per hour. The latter dose rate is found in areas where the bed rock contains 0.05 per cent of uranium oxide U_3O_8 .

DIESEL POWER IN DIAMOND DRILLS

In recent years there has been a noticeable trend in the use of diesel power in diamond drills. Tests have proved that the diesel unit is one third more efficient than a petrol engine of similar horse-power, is efficient at low and high speeds, and at full loads is more economical than the petrol motor. At part loads the diesel is more than twice as economical as the petrol unit which is a most important factor in diamond drilling where part loading is the rule rather than the exception.

MINING MISCELLANY

A four-man trade mission from the U.S. is to visit Malaya in March, not with order books but to have informal talks with Malayan businessmen on how they could make contact with U.S. firms.

A Japanese firm, Mitsubishi Shoji Haisha Ltd., will officially open a branch in Singapore next month and estimates that it will export 10,000 tons of iron ore a month from Malaya to Japan. It also hopes to handle rubber and tin ingots.

Rich new deposits of lead, zinc and copper ores have been found near the village of Madjarevo, in South Bulgaria. There is also an admixture of gold and silver in the ores. The first shaft will be completed shortly. A plant for separating the ores will be built near the mines.

Dr. J. R. F. Joyce, consulting geologist for British Titan Products and its American associate, Columbia-Southern Chemical Inc., has returned to Sierra Leone and is trying to determine the extent to which mining of titaniferous minerals could be started by British Titan Products in the very near future.

It has been estimated that Venezuela's total iron ore reserves are in excess of 2,000,000,000 tonnes, half of them already being under concession. Proved reserves in the Orinoco Mining Co.'s Cerro Bolivar mine alone are in the region of 500,000,000 tonnes of high-grade ore. Since August, 1956, Venezuela's monthly production rate has been more than 1,000,000 tonnes.

Portugal hopes to be producing electricity from nuclear power by 1965. By 1958 a research laboratory, equipped with an American particle accelerator and a smaller one from Holland, will be set up as well as a pilot power plant. Bids for a swimming pool reactor are under study. Portugal is already a producer of uranium and prospecting continues in the north-east.

In the first half of January, for the first time in a number of months, Poland's coal miners implemented their tasks for the first fifteen days, extracting 6,976 tons of coal over plan. They succeeded in making good a deficit of 27,000 tons incurred during the first three working days. Among other things, implementation of the plan was due to a drop in absenteeism and an improvement in discipline.

Preparatory work is proceeding at Pakistan Industrial Development Corporation's mines at Kalabagh, which are to supply iron ore for the corporation's proposed iron and steel plant at Multan. About 40,000 tons of ore have been stockpiled in readiness, and the chief mining engineer is planning a target production of 5,000 tons of ore per day to be reached in five years' time.

Three scientists of the California Institute of Technology—a geologist, Dr. A. E. J. Engel, and two geochemists, Messrs. Samuel Epstein and Robert N. Clayton—have found that the location of underground ore is indicated by variations in oxygen isotope ratios in surrounding rock. Dr. Robert P. Sharp, chairman of the Institute's Geological Division, said that the new discovery might prove "one of the most significant contributions to ore prospecting in the past 50 years."

The modernization programme at the Makawal collieries of the Pakistan Industrial Development Corporation is making progress, though hampered by the slow arrival of equipment. Improvements are being made to bring about increased production and to reduce the amount of handling to which coal is at present subjected. It is estimated that when the modernization programme has been completed, production could reach 1,500 tons a day.

A 14-mile railway spur line is to be laid in Northern Manitoba this spring prior to the construction of a \$40,000,000 hydro-electric plant on the Nelson River. The plant, twice the size of any now operating in the province, will provide power for the \$175,000,000 dollar nickel development in the vicinity of Mystery and Moak Lakes. The spur line will run from the Canadian National Railways Hudson Bay Line to Grand Rapid, 425 miles north of Winnipeg. The Nelson number one power project will include a \$20,000,000 standard power house with an initial installation of five vertical turbo-driven generators of 30,000 kilowatts capacity each.

A £4,750,000 modern ore handling, screening and sintering plant, has been completed at the Port Kembla, New South Wales, iron and steel works of Broken Hill Proprietary, Ltd. Supplied by the Lurgi Chemie Co., of Germany, it was installed to utilize the fines screened from ore, which, together with flue dust recovered from furnaces is sintered into a form more suitable for smelting in blast furnaces for the production of pig iron. This ore beneficiation has made possible more efficient blast furnace practice and will also conserve Australia's ironstone resources.

Under-water oil exploration in the Qatar area of the Persian Gulf is to be continued by Shell. Since the wrecking of its £900,000 mobile drilling platform in a storm on the night of December 27/28, last year, the company has had to consider whether to continue to operate its off-shore concession in this region. The decision has now been taken to drill a further well at a location in the northern half of the area. Results from the two previous wells, sited further south, were disappointing and they were abandoned at 6,700 and 12,000 ft. respectively. Another drilling platform will be needed for the new well. The new well will be sited in 80 ft. of water, 35 miles

from the nearest land, and 65 miles N.N.E. of Doha. Shell have so far spent £7,500,000 on under-water exploration at Qatar where they have been operating since 1953 and drilling since 1955.

A new mineral purchasing depot has been opened by the British Metal Corporation at Kikagati, Uganda. Besides acting as a purchasing centre for minerals, it will sell explosives. The depot was formerly run by the British Tin Smelting Co. and has been closed for 10 months. Mr. Stanley Webb, a member of the Uganda mineral buying trade, has been appointed resident manager.

PERSONAL

Dr. Arthur S. Fleming has resigned his position as Director of the Office of Defence Mobilisation (U.S. Government). He will be succeeded by Mr. Gordon Gray, present Assistant Secretary of Defence for International Security Affairs.

Mr. D. T. Lewis has resigned from the Boards of Sungei Kinta Tin Dredging and Ipoh Tin Dredging. Mr. E. H. Fenson has been appointed a director of the companies.

Mr. Charles E. Jobling has retired from the board of Mawchi Mines.

Mr. R. B. Woakes has relinquished his position as a director of Kwahu Mining Co. (1925) Ltd. Mr. J. A. Griffiths has been appointed a director.

The annual dinner of the Institution of Mining and Metallurgy will be held at Goldsmiths' Hall, London, on Monday, May 6, 1957.

The British Metal Corporation Ltd. has opened an office at Kikagati, Uganda.

The address of the Southampton branch office of British Insulated Cables Ltd., as from February 25, will be 16/17 Vincent's Walk, Southampton. The telephone number, Southampton 26176/7, will remain unchanged.

CONTRACTS AND TENDERS

B.T.H. has secured an order valued at over £2,500,000 for the supply of hydro-electric plant for the Belesar and Fume power stations of Fuezas Electricas del Noroeste, S.A. (Fenosa) of Coruna, Spain.

The National Coal Board has ordered two a.c. electric winder equipments from Metropolitan-Vickers Electrical Co. for installation in the east and west shafts of Nine Mile Point Colliery, near Ystrad Mynach, Glamorganshire (No. 5 Area, S.W. Division). The electrical equipment will be made by Metropolitan-Vickers and the mechanical parts by Robey and Co. and M. B. Wild and Co. acting as sub-contractors. The value of the contract is about £150,000.

Metals and Minerals

No Sign of Aluminium's Saturation Point

There is no indication of aluminium reaching a saturation point in the U.S. economy, states Mr. E. M. Strauss, Jr., manager of commercial research for Alcoa. Mr. Strauss told the industrial marketing section of the American Marketing Association at New York that consumption of aluminium this year is expected to be about 8 per cent higher than in 1956. Though current supplies have at last caught up with demand, the industry is bullish about the continued growth of its markets. To-day, nearly all primary producers of aluminium have—or plan to have—commercial research or marketing research organisations.

Aluminium smelters in the U.S. have called for sharply reduced scrap export quotas during the second quarter. In an industry advisory meeting with Business and Defence Service Administration officials, they recommended limits of 1,500 tons on the quarter's exports. The present limit is 5,000 tons. The smelters based their appeal on estimates of an 8–10 per cent increase in business this year. A growing use of aluminium by the automotive industry was cited as contributing to the smelters' business.

Plans leading to a vast expansion of the U.S. domestic aluminium industry along the St. Lawrence moved a step nearer realization when Governor Averall Harriman, of New York, approved with some modification a power contract earlier worked out by Reynolds Metals Co. and the New York State Power Authority. This means that Reynolds will put machinery in motion to start construction this spring of a new 100,000-ton aluminium reduction works at an estimated expenditure of \$88,000,000. An aluminium casting foundry for automotive parts will be constructed close to this plant by the General Motors Corporation. Scheduled to open in June, 1959, this will be the second aluminium foundry of General Motors to be located near a Reynolds Metals Co. reduction plant.

Olin Mathieson Chemical Corporation and three other U.S. companies have agreed on plans for a 675,000 kW. power plant near Cresap, West Virginia, to supply power for a large aluminium reduction and fabricating facility to be built in the area. The three other companies are Ohio Power Co., Revere Copper and Brass Inc., and Wheeling Electric Co. Olin Revere Generating Corporation's two units will supply power to Olin Revere Metals for reduction of aluminium and to Olin Mathieson for the fabrication of aluminium, both at facilities to be located near Clarington, Ohio. A third unit will be owned by Ohio Power.

The Business and Defence Services Administration, U.S. Department of Commerce, has announced that 70,000 tons of aluminium will be set aside from the total supply available in the second quarter of 1957 to fill Department of

Defence and Atomic Energy Commission orders. This reserve is 1,500 tons more than the amount set aside for similar orders in the first quarter of 1957.

Preliminary figures indicate that, despite an increase in productive capacity during the year, a combination of factors held Canadian exports of aluminium last year to a level slightly under that of 1955. During 1956, Canada exported a total of 508,894 tons of primary aluminium, compared with 515,489 tons in 1955.

Shortage of water is again affecting Canadian producers by cutting production of hydro-electric power. Alcan anticipates that it will have to reduce output on February 25 at its plant at Arvida, Quebec. The company said the cut would last until the spring thaw. Seven or eight pot lines would probably be closed, with a loss of two per cent of the total annual Canadian production capacity, or four per cent of the Arvida unit's yearly output.

West German aluminium consumption is expected to increase by between 5 and 6 per cent annually in the next few years. Last year it rose by 3 per cent to 271,000 tons. Domestic production of virgin aluminium amounted to 147,000 tons.

A New York construction firm has announced plans to build the "first gold-aluminium skyscraper in the U.S. The building will have 34 storeys and will be sheathed in gold-anodized aluminium.

TUNGSTEN SUBSIDY RESTORED

The Senate Appropriations Committee at Washington has restored the appropriation of \$30,000,000 for supporting the domestic production of tungsten, fluor-spar, columbium-tantalum and asbestos during the remainder of the present fiscal year. The money had been removed from the urgency deficiency at the request of a House Appropriations Sub-Committee. Its restoration might be described as mildly bullish for tungsten, but there may still be a battle over this measure when the Senate and House versions go to the committee for approval.

A deposit of tungsten believed to be potentially rich has been located in eastern New York State and adjoining Vermont by technicians of the General Electric Company. It has been stated that the deposit extends from the U.S.-Canadian border southward for at least 150 miles, and that at one point where tests were made the belt was 30 ft. deep. The opinion was expressed that a commercially feasible deposit in this location could make the U.S. independent of foreign sources for tungsten—a dismal prospect for overseas suppliers! However, at this very early stage forebodings would be distinctly premature!

The Korean Small and Medium Tungsten Mines Association has applied for permission to export ore to Japan. Korean exports of tungsten ore have fallen steeply since 1953, when the U.S./South Korean tungsten ore agreement expired. In 1953 South Korea exported a peak quantity of 7,500 tons of tungsten to the U.S. for more than \$31,250,000. Sales in the past 10 months, mostly to U.S. buyers, dropped to about 3,380 tons. Due to the fall in world tungsten prices, the proceeds amounted to only \$5,400,000.

The decrease in tungsten exports has affected the Korean Tungsten Corporation, which is responsible for 80 per cent of the total output, but it has hit medium and small mines harder. It is hoped at Seoul that exports of tungsten to Japan will help to ease present management difficulties.

NICKEL AND COBALT FIND

Rich cobalt and nickel deposits estimated to contain 75,500,000 tons of ore have been found on the island of Waigo, north-east of Netherlands New Guinea. Waigeo is separated from the mainland of Netherlands New Guinea by the Dampier Straits. According to the Netherlands Government, interest in exploitation of these deposits has been shown both in Holland and abroad. In granting concessions, it was stated, the Government will take account of the fact that it would be difficult to build up a mining industry in New Guinea and that many facilities are lacking. Financial conditions would have to be such as to give sufficient incentives to private enterprise to make the big investments needed, but at the same time they should ensure that, should an enterprise prove profitable, "the country will have a fair share in the returns". One condition would have to be that the ores mined should be processed in Netherlands New Guinea, "if economically possible".

COPPER · TIN · LEAD · ZINC

WHAT PRICE SUPPORT?

With the U.S. domestic producers trimming their price a further 2 c. to 32 c. (previous 2 c. cut occurred a fortnight ago) and with no sign as yet of any major cutback in production, people are naturally beginning to wonder whether the policy of the American copper companies will be to let the price continue to slip back until stockpile offtake on domestic price support contracts brings about an automatic stabilization. In this context 30 c. seems to be a popular guess as to the break-even point.

When we were discussing this matter here last week we were unaware that the various floor price contracts entered into the U.S. government under Defence Pro-

duction Act carried escalator clauses covering future increases in the general level of costs. The effect of these on a contract placed perhaps three years ago could be considerable, and it may well be that under practically all the floor price contracts, copper would now become saleable to the stockpile at from 28 c. up to perhaps 35 c., with the bulk of the tonnage possibly in the 30 c. to 33 c. bracket. These figures make considerably more sense of the apparently widely held American view that with copper at 30 c. all the current world surplus of production over consumption (put at 15,000 tons per month) would be taken up by the stockpile. With such a firm floor under them, the producers' apparent reluctance to cut back production is understandable.

Meanwhile, January shipments to consumers in the States, and even more outside the States, have shown remarkable strength. Shipments to U.S. consumers at 119,925 tons show a gain of some 20,000 tons over the previous month and are the best since June last, while shipments to consumers outside the States at 143,589 tons constitute an all-time record and are 26 per cent above the monthly average for last year. Just where the increased offtake is going is not absolutely clear, although Germany and Japan are reported to have been taking large tonnages. The possibility of Russia being in the market cannot be ruled out.

PENANG STRIKE GOES ON

The New York spot quotation for Straits tin, although still nominal was being quoted at 100 c. on Wednesday, a drop of 2½ c. on the week reflecting no doubt the reported settlement of the dock strike which hit the Atlantic seaboard last week. The strike at the Penang smelter continues, however, although there were signs at the end of last week that the dispute might now go to arbitration,

which presumably would imply a return to work pending the enquiry.

★

Year-end production figures for Nigeria at 9,062 tons reveal an increase of 900 tons over the previous year's total and makes 1956 the best year for Nigerian tin production since 1948. It would be interesting to know how far the decline in the columbite market has brought this increase about, by encouraging mines to switch to relatively higher tin-bearing areas.

LEAD AND ZINC UNCHANGED

In the States the markets both for lead and zinc have been featureless with prices unchanged at 16 c. and 13½ c. respectively.

U.S. galvanizers are reported to have had a record year in 1956, shipments of sheets totalling 2,957,991 tons—some 93,000 tons better than in the previous year. This news, coupled with the American Zinc Institute's recent prediction of another good year ahead for galvanizers, should provide some consolation for producers of Prime Western grades.

Concerning the forecast published here three weeks ago, the Bureau of Mines gives the U.S. mine output of recoverable lead in 1956 at 348,329 s.tons, an increase of 10,300 s.tons over 1955.

The London Metal Market

(From Our L.M.E. Correspondent)

There is a continuance of the downward trend in all markets noted last week and there have been few signs of any increased consumer interest, but the "market feeling" is strengthening that a corrective upward movement cannot be long delayed.

In the copper market the week has seen a reduction in the R.S.T. price to £240 per ton and a reduction in the U.S. primary producers' price to 32 c. per lb., with, at the time of writing, no corresponding reduction in the custom smelters' price which is now at the same level. The surprising factor has been the absence of any announcement from the American producers of steps to curtail production to maintain the present price, and this has given rise in some quarters to a feeling that a stand will not be made until 30 c. per lb. is reached.

In London the outstanding event has been a technical squeeze which developed over last week-end causing a backwarranty of up to £3 10s. to be paid on Monday, but since then the position has eased considerably. Consumer buying remains at a very low level, but, as consumption itself is still good, stocks are rapidly being run down which will be a considerable factor immediately any upturn in price becomes apparent.

The activity in the tin market continues with no major alterations in either the price level or the rate of backwarranty, although the latter has increased slightly again through technical considerations. The general opinion seems to be that there will be no distinct trend in the tin market for some weeks unless one is created by outside political events. On Thursday morning the Eastern price was equivalent to £768½ per ton c.i.f. Europe.

Both the lead and zinc markets continue to slide back very gently, and the general impression is that any big order would reverse the trend very easily; in these two metals the reluctance of consumers to buy is less marked than in the case of copper, and industrial stocks have probably not decreased very much since the beginning of the year.

Closing prices and turnovers are given in the following table.

LONDON METAL AND ORE PRICES, FEBRUARY 21, 1957

THE WEEK ON THE L.M.E.

	February 14		February 21	
	Buyers	Sellers	Buyers	Sellers
COPPER				
Cash ..	£250	£251	£243½	£244
Three months ..	£248	£248½	£242	£242½
Settlement ..	£251		£244	
Week's turnover	6,375 tons		9,350 tons	
LEAD				
Current ½ month	£113½	£114	£113½	£113½
Three months ..	£113	£113½	£112½	£112½
Week's turnover	3,475 tons		2,400 tons	
TIN				
Cash ..	£771	£772	£767	£768
Three months ..	£752	£753	£748	£749
Settlement ..	£772		£768	
Week's turnover	1,250 tons		645 tons	
ZINC				
Current ½ month	£100	£100½	£98	£98½
Three months ..	£96½	£97½	£96	£96½
Week's turnover	7,650 tons		3,750 tons	

METAL PRICES

Aluminium, 99.5%, £197 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £210 per ton
Crude (70%) £200 per ton
Ore (60%) bases 23s. 6d./24s. 6d. nom. per unit, c.i.f.
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 12s. 0d. lb.
Cerium (99% net), £13 18s. lb. delivered U.K.
Chromium, 7s. 2d. lb.
Cobalt, 19s. lb.

ORES AND OXIDES

Bismuth ..	65% 8s. 6d. lb. c.i.f.
Chrome Ore—	20% 3s. 3d. lb. c.i.f.
Rhodesian Metallurgical (semifriable) 48%	£17 8s. 0d. per ton c.i.f.
" Hard Lump (45%)	£17 8s. 0d. per ton c.i.f.
" Refractory 40%	£12 15s. 0d. per ton c.i.f.
" Smalls 42%	£16 5s. 0d. per ton c.i.f.
Baluchistan	£18 15s. 0d. per ton c.i.f.
Columbite, 65% combined oxides, high grade	185s./197s. 6d. per unit
Fluorspar—	
Acid Grade, Flotated Material	£22 per ton ex. works
Metallurgical (75/80% Ca F ₂)	151s. 6d. ex. works
Lithium Ore—	
Petalite min. 3½% Li ₂ O	£8-£10 per ton f.o.b. Beira
Lepidolite min. 3½% Li ₂ O	£8-£10 per ton f.o.b. Beira
Amblygonite basis 7% Li ₂ O	£28-£32 per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£22 0s. d/d
Molybdenite (85% basis)	8s. 5d. nom. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO ₂	£73/£75 per ton c.i.f. Aust'n
Ilmenite 52/54% TiO ₂	£11 per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	181s./186s. per unit c.i.f.
Manganese Ore Indian	
Europe (46%-48%) basis 155s. freight plus 17½% surcharge	141d.-151d. nom. per unit c.i.f.
Manganese Ore (43%-45%)	116d. nom. per unit c.i.f.
Manganese Ore (38%-40%)	111d. nom. per unit
	(including duty)
Vanadium—	
Fused oxide 90-95% V ₂ O ₅	£12½-£13½ per unit c.i.f.
Zircon Sand (Australian) (65-66% ZrO ₂)	£20 per ton c.i.f.

Germanium, 99.99%, Ge. kilo lots 3s. 4d. per gram
Gold, 249s. 4d.
Iridium, £27/29 oz. nom.
Lanthanum (98/99%) 15s. per gram
Manganese Metal (96%-98%) £310
Magnesium, 2s. 5½d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £20/22 oz. nom.
Osmiridium, nom.

Palladium, £8 0s./£8 10s. oz.
Platinum U.K. and Empire Refined £34 oz.
Imported £34/£35 nom.
Quicksilver, £84½/£85 ex-warehouse
Rhodium, £42 oz.
Ruthenium, £15/£17 oz. nom.
Selenium, 85s. nom. per lb.
Silver, 80d. f. oz. spot and 79½ f'd.
Tellurium, 15s./16s. lb.

Mining Finance

"Tanks Central" and "Central Sallies"

At the end of last year diamond drilling for gold-uranium deposits on Farm Reitkuil No. 86 belonging to Afrikaner Lease—which is included in what is known as Block B.2, lying about six miles north-west of the Afrikaner mine—had been very encouraging, and that consideration was being given to turning the proposition to account. A circular has now confirmed that this is to be done, and has outlined the financial and technical arrangements which will be necessary. Afrikaner Lease holds a 60 per cent interest in this venture and Tanganyika Central Gold Mines has a stake amounting to 40 per cent.

Afrikaner Lease is a subsidiary of Central South African Lands and Mines which holds over 75 per cent of its capital. The other important shareholder is Tanganyika Central Gold Mines. Owing to narrowing profit margins, and a falling grade of ore milled, the future of Afrikaner Lease as a gold producer is limited. During the year ended June 30, 1956, the company milled 195,400 tons of ore at 2.35 dwt. per ton and made a working loss of about £21,600. It was, in fact, uranium earnings at £85,600 that reversed this position and enabled a dividend of 10 per cent to be paid. The latest circular makes it quite apparent that the mine's future will become further bound up with uranium as time progresses. Indeed, discoveries at Block B.2 have considerably enhanced the outlook for Afrikaner Lease's profit earning capacity during the A.E.C. contract period, besides which its competitive position as a uranium producer after this time emerges in a most favourable light. Yet owing to official secrecy regarding uranium prices and costs, it is not possible to estimate exactly to what extent the mine stands to benefit financially from these discoveries. A prospecting programme consisting of some 17 boreholes at Block B.2 has disclosed many uranium values of well over 100 in.-lb., and one actually as high as 229 in.-lb. So far, since the release of uranium information by South African producers, only Luipaards Vlei with values of around 80 in.-lb. can compete in any way with these results. A list of drilling disclosures included with the circular shows, however, that Block B.2 is not likely to be valuable in respect of gold.

In view of these excellent results, Afrikaner Lease is making application for permission to substitute Block B.2 ore for lower grade tonnages presently obtained elsewhere and treated by the joint uranium plant at Stilfontein. The company's allocation under this scheme is 21,000 tons monthly, and it is hoped to obtain the whole of this tonnage from Block B.2 in two stages. The first target will be a total of 15,000 tons monthly before the end of 1958, and if development goes well this will later be increased to the full amount. The total cost of the scheme, including shaft sinking etc., is estimated at £320,000 but only about £150,000 will be needed to bring the new section into initial opera-

tion. It is therefore proposed to raise £150,000 by way of permanent and loan capital, leaving £170,000 to be financed out of anticipated profits.

As the granting of a mining authority for the new area is conditional upon Afrikaner Lease holding the prospecting options concerned in its own right, agreement has been reached with "Tanks Central" to acquire that company's 40 per cent interest in Block B.2 and also its stake in another area named Block B.1. In payment for these interests, the company will issue 335,000 "A" shares of 5s. These units will not rank for dividend in respect of the period ended December 31, 1957.

To raise the sum of about £110,000, Afrikaner Lease is to offer for subscription 465,000 shares for cash at par in the ratio of three for ten held. In addition, a total of £40,000 will be provided by loans of £27,000 from "Central Sallies" and £13,000 from "Tanks Central".

Circulars have also been issued to shareholders of "Tanks Central" and "Central Sallies". The first of these confirms that the company will subscribe at par for 61,800 new shares in Afrikaner Lease on the basis of three for ten, thereby raising its holding to 27.4 per cent. "Central Sallies" entitlement under the issue will be 322,920 shares, but the right to subscribe at par for 182,415 of these in the ratio of one for four will be passed to its shareholders. The company itself intends to subscribe for 140,505 shares and will, therefore, offer its own shareholders subscription rights at 15s. per share for 58,372 new ordinary shares in the ratio of two for 25.

Block 2 is not the only section of the area lying to its north-west in which Afrikaner Lease is interested. The company has actually started mining operations on a further section, Block A, and is at present crushing the resultant

ore at its own mine. At another section, Block B.1, prospects are considered to be favourable and further drilling will eventually be undertaken. Lastly, there is Block C in which Afrikaner Lease and "Tanks Central" have 60 per cent and 40 per cent respectively. This is regarded as a long-term proposition and little prospecting has yet been done.

Although official secrecy as yet prevents a detailed appraisal of the outlook for increasing earnings at Afrikaner Lease, one way and another the mine's future appears to have distinct possibilities as, indeed, must have the shares of "Tanks Central" and "Central Sallies".

WALL STREET IMPROVES

More hopeful utterances about the U.S. economic outlook steadied Wall Street but, in London, the Socialist victory at North Lewisham and the £300,000,000 government funding operation made for idle markets.

Kaffirs have been flat and featureless. Selling from Paris and the Cape and little or no buying here depressed most issues. Coppers drifted lower on the easier price trend of the metal. Platinums, diamonds, and tins have held fairly steady.

Index	Feb. 14	Feb. 20
Dow Jones Ind. ...	461.56	469.0
F.T. Ind. Ord.	185.4	185.8
F.T. Gold	74.2	72.6

WESTERN SELECTION GROUP QUARTERLIES

Company	Dec. qtr. 1956	Sep. qtr. 1956	June qtr. 1956
Amal. Banket	93,532	111,144	55,498
Ariston	139,499	128,940	94,356
Bremang	47,449	56,915	34,672
G.C.M.R.	35,195	41,799	35,765

RECENT INTERIM DIVIDEND ANNOUNCEMENTS

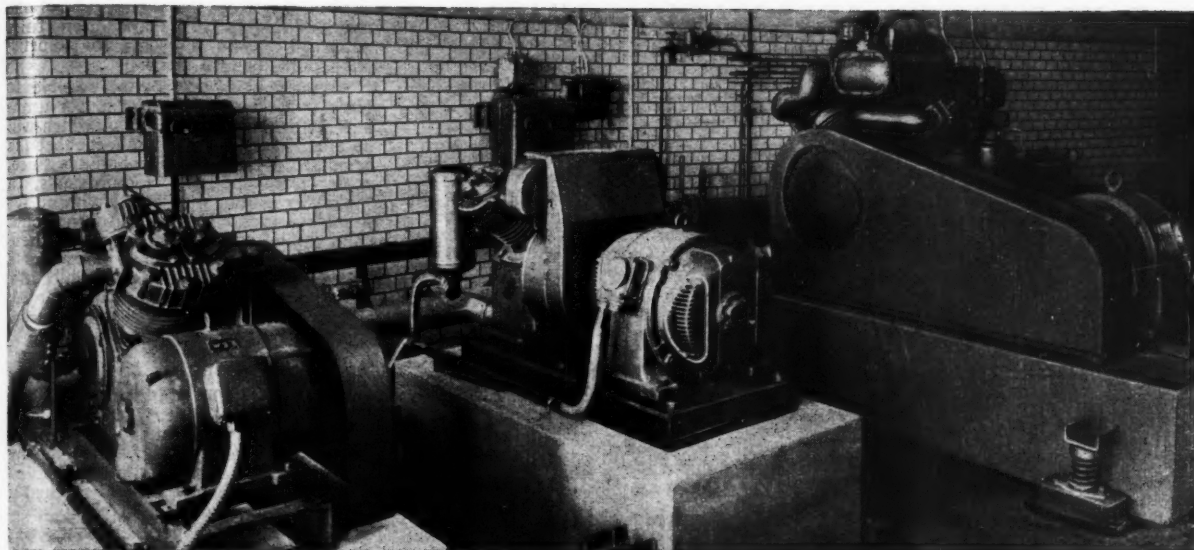
Company	Year ending	Dividends Latest	Corresponding %	Date Payable	Total Last Year
Camp Bird (a)	30. 4.57	10	12½	Mar. 29	20
North Kalgurli (b)	20. 3.57	12½	12½	Mar. 22	25
Wankie Colliery	31. 8.57	5	3½	Apr. 13	10
Witbank Colliery	31. 8.57	17½	15	Mar. 23	32½
Amalgamated Tin	31. 3.57	8	12	Mar. 27	45
S. Kinta Cons.	31. 3.57	20	20	Mar. 27	82½
Lydenburg Plat. (c)	31. 8.57	8½		Mar. 29	33
Potgietersrust Plat. (b)	31. 8.57	61.1	55.6	Mar. 29	155.6
Rustenburg Plat. (b)	31. 8.57	80	70	—	200
Union Plat. (b)	31. 8.57	14½	13½	Mar. 29	27½
Waterval Plat.	31. 8.57	31	28½	Mar. 31	80
Electrolytic Zinc	30. 6.57	15	15	May 3	65
Great Boulder Prop. (d)	31. 3.56	37½	37½	May 10	62½
Transvaal & Delagoa	31. 8.57	22½	22½	Mar. 22	55
British S.A. Co.	30. 9.56	25	23½	Mar. 30	30

(a) On increased capital and in respect of 16 months ending 30.4.57.

(b) On increased capital.

(c) On increased capital. Last year's dividends were in respect of 14 months operations.

(d) On increased capital. First interim on previous capital.



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ATLAS COPCO CT & NT COMPRESSORS

The Atlas Copco CT and NT series is a range of small stationary compressors with air capacities ranging from 40 to 300 cubic feet per minute. Both CT and NT compressors are air-cooled, two-stage, single-acting machines that can be easily mounted on a proper foundation or on a skid base. Some NT compressors are also supplied as complete power-pack units.

CT and NT compressors are compact, thoroughly reliable, and constructed on the same rugged lines as the well-known Atlas Copco AR series. For running air tools, for manufacturing processes where limited amounts of air are required, and for constructional and mining operations, CT and NT compressors fill the bill perfectly. Built for continuous service, highly efficient and low on maintenance costs, CT and NT compressors are an exceptionally economical proposition.

Air Cooling and Pressure Lubrication

Because they are air-cooled, CT and NT compressors are independent of a water supply—often a problem on contractors' sites. And to eliminate belt troubles

the fan of the CT compressor is operated from the crankshaft by means of bevel gears. Other outstanding features, and not usually found on small compressors due to the expense, are pressure lubrication and, on the CT, main crankshaft roller bearings. Such features indicate the thought and care that have gone into the design and construction of Atlas Copco CT and NT compressors—the finest of their type available.

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THE *Atlas Copco* GROUP OF COMPANIES

Manufacturers of Stationary & Portable Compressors, Rock-Drilling Equipment, Loaders, Pneumatic Tools & Paint-Spraying Equipment

RAND SELECTION CORPORATION LIMITED

(Incorporated in the Union of South Africa)

GROWING REVENUE FROM NEW GOLD MINES

The following are extracts from the review by the Chairman, **Mr. Anthony Wilson**, which has been circulated with the annual report and accounts:—

The corporation has had a satisfactory year. We are now receiving a growing accrual from our investment in companies in the Orange Free State and Klerksdorp districts, and can look forward with confidence to further increases from these sources. The second decade of mining development in the Orange Free State was marked by the declaration in January, 1957, of a maiden dividend by Orange Free State Investment Trust, Limited, through which we have a substantial indirect interest in addition to our direct interest in the mining companies themselves.

The profit for the year before taxation was £1,102,889 (1955, £1,174,920), which together with the unappropriated profit at September 30, 1955, of £447,307, left a balance of £1,550,196 available for appropriation and distribution.

Of this amount £80,000 was appropriated for taxation and £345,000 as a provision against loans. An unchanged dividend of 2s. 3d. per share was declared on November 15 and an unappropriated profit of £272,173 has been carried forward to the next financial year.

GOLD COAST MAIN REEF

The twenty-third annual general meeting of Gold Coast Main Reef, Ltd., was held on February 20 in London.

Major-General W. W. Richards, C.B., C.B.E., M.C., chairman, presided.

The following is an extract from his Statement circulated with the Report and Accounts for the year ended June 30, 1956:—

Last year, I explained that the cessation of production from November 20, 1955, to February 26, 1956, due to the strike of African employees, would have the most serious effect on the year's results. Strike expenditure amounted to £50,342.

No dividend distribution was possible and the Company commenced the current year with a debit balance of £15,584.

Ore Reserves.—There was a gratifying increase of 32,066 tons in the Ore Reserves which, at June 30, 1956 (including ore in pillars) amounted to 356,414 tons, averaging 8.31 dwts. per ton, over a width of 72.9 inches.

The Chairman, addressing the meeting, said: We submit a Resolution that the name of the Company shall be changed to Ghana Main Reef, Ltd. We look to the future of Ghana with a proper measure of confidence and hope. A country abounding in natural resources where, in my view, British invested capital will continue to receive consideration and encouragement.

The Report and Accounts were adopted and the Resolution changing the name of the Company was approved.

The improved cash balance of the corporation is reflected by an excess of current assets over current liabilities of £750,071. Your corporation is therefore in a satisfactory position to take advantage of further opportunities for profitable investment which may arise.

In the Klerksdorp area, Vaal Reefs commenced the production of gold and uranium in May, 1956, and Hartebeestfontein the production of uranium in November, 1956. Both declared their maiden dividend during the year. At Buffelsfontein, gold production commenced in January, 1957, and uranium production is expected to start about six months thereafter.

Uranium

Moreover, profits and the potential of those mines in the Union in which we are interested which are producers of uranium, will now be more apparent to shareholders in consequence of some recent relaxation of security measures. All these producers have a 10-year contract for the disposal of their entire output, the price payable being related to the cost of production on a basis which will ensure redemption of the cost of the plants, plus interest, over the 10-year period and provide a margin of profit. By the time each contract

expires, therefore, the capital cost of the uranium plants will have been fully redeemed and no allowance for amortisation need then be made.

Although it is clearly not possible to forecast the extent of demand for uranium at that stage and the price which will be offered, one may be confident that the demand for uranium will continue, since, apart from military requirements, a rapidly expanding market is envisaged for peacetime uses. This being so, the relief from capital costs and the fact that these producers produce uranium oxide as a by-product of gold mining, to which the actual costs of mining are fully charged, should place the South African producers in a favourable position to participate in future demand.

Our investment in the diamond industry, through our substantial interest in Anglo American Investment Trust, Limited, continues as a major source of revenue. The Trust company for 1956 again distributed a dividend of £1 per share. Diamond sales reached a record of £74,546,010.

The demand for gem diamonds was heavier than in 1955, in spite of a sizeable inflow to Europe of diamonds smuggled out of Sierra Leone. It was solely the shortage of diamonds produced that kept the gem figure at approximately £50,000,000.

Production operations, however, have been stepped up by the Consolidated company in South West Africa; and in Tanganyika, Williamson Diamonds Limited, have increased their output appreciably.

BARROW HEPBURN & GALE

CONDITIONS IN SOLE LEATHER INDUSTRY

The 36th ordinary general meeting of Barrow, Hepburn & Gale Limited will be held on March 15 in London.

The following is an extract from the circulated statement of the Chairman, **Mr. George W. Odey, C.B.E.**:

Last year I indicated the extent to which your Company is committed to the sole leather industry. During the year under review this important part of our activities has continued to cause great anxiety. The price of sole leather sagged until a point was reached where bottom leather was selling at 10 per cent. below the cost of production. It is this factor which accounts almost entirely for the considerable diminution in our profits as compared with the previous year. During the last quarter of the year there was an appreciable improvement in the price level and, at the same time, a marked increase in demand, resulting in a substantial reduction of stocks in tanners' hands.

We finished the year with our stock of sole leather at less than one-week's production, which is an all-time low. We are therefore well placed to take advantage of any improvement in the price level which may now develop. There has undoubtedly been a considerable improvement in the whole position during the last quarter of 1956 and, provided the industry acts with caution, there would appear to be no reason why this improvement should not be maintained in the coming year.

Mitcham factory: The productions in this department have continued to expand, a higher turnover having been achieved in spite of more severe com-

petition. When completion is effected of the extensive plant which we have installed, our production of plastic conveyor belting should be materially increased. We have maintained our very high reputation for plastic belting designed for the coal mines, and we look forward with every confidence to the expansion of this production.

Dividend Policy

With regard to our dividend policy, have, on many occasions, warned the Shareholders that we are engaged in an industry where wide fluctuations in profits in some years are inevitable. In the present year we felt that we had to take cognizance of the fact that in the last two Budgets there was an increase of tax on Distributed Profits. We felt, therefore, that our proper course was to reduce our dividend from 25 per cent. to 20 per cent.

South African Subsidiaries: The Hodson Extract Company (Pty.) Ltd. operates a wattle extract factory at Merebank near Durban. As a result of research work which our scientists are constantly pursuing it has been possible to improve very considerably the quality of the extract. While this will undoubtedly result in some diminution in the profits, at the same time there is the satisfaction of knowing that it will result in the production of an extract of unsurpassed quality.

With regard to Hodson Estates (Pty.) Ltd., the Company is beginning to realise the benefit of constant yearly increase in the production of wattle bark. We can, therefore, look forward over the next few years to increased dividends from the Estates Company.

22, 1957

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